

Wavelength Shifter (With Stabilization and Data Encoding)

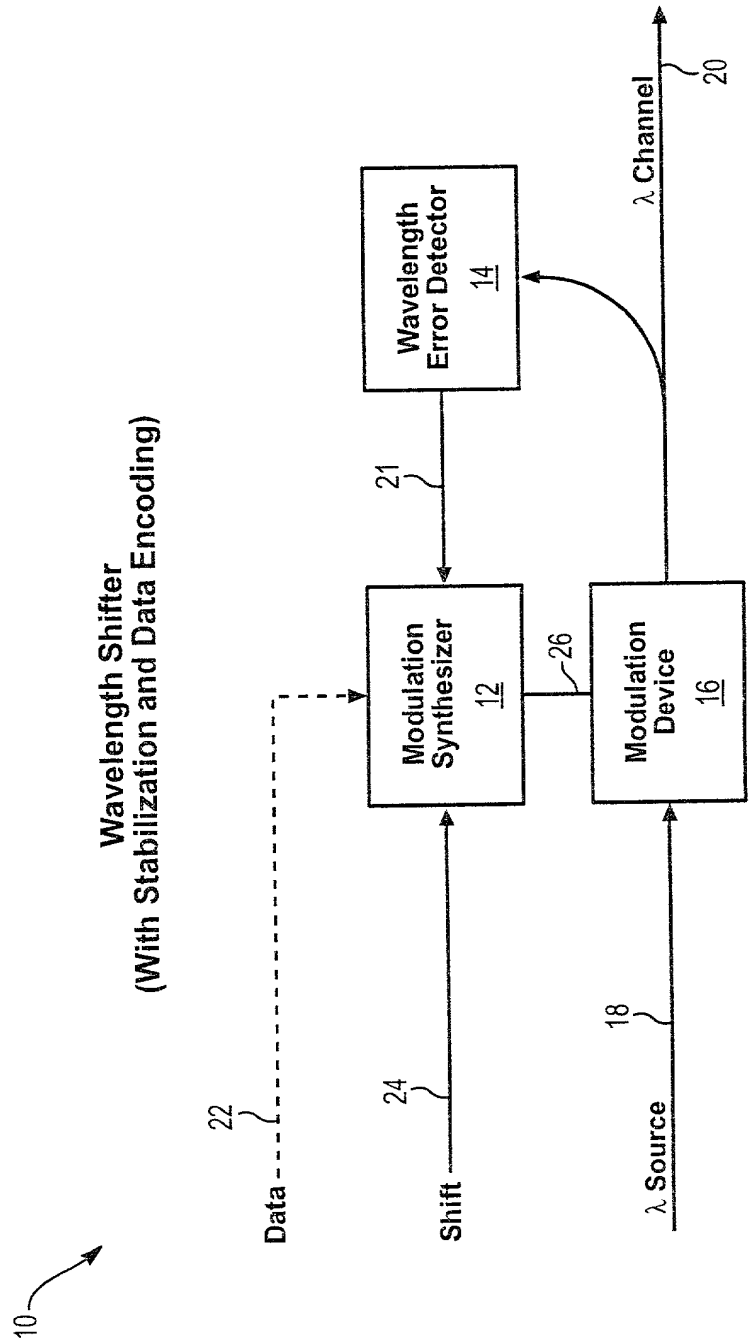


FIG. 1

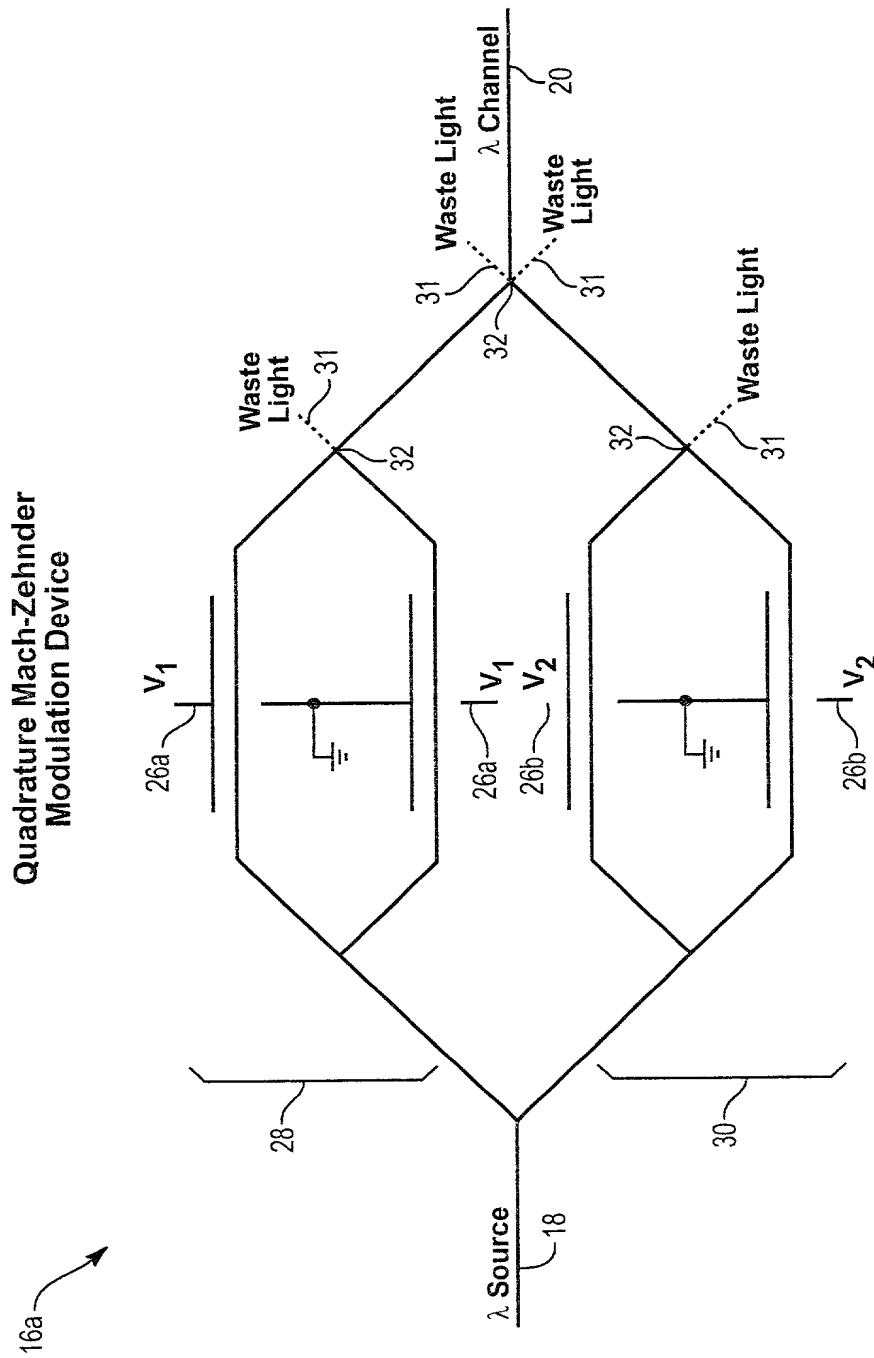


FIG. 2

# Mach-Zehnder Device Transfer Function

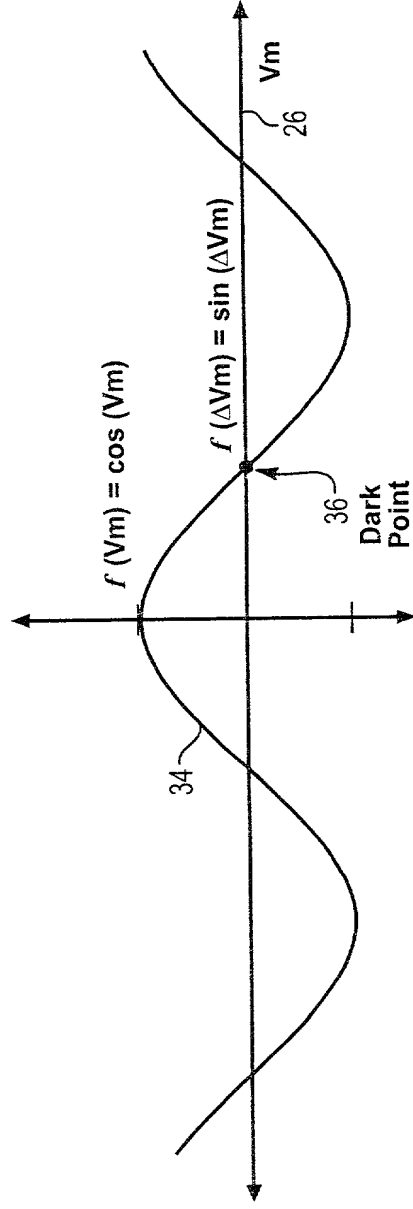


FIG. 3

12

# Modulation Synthesizer

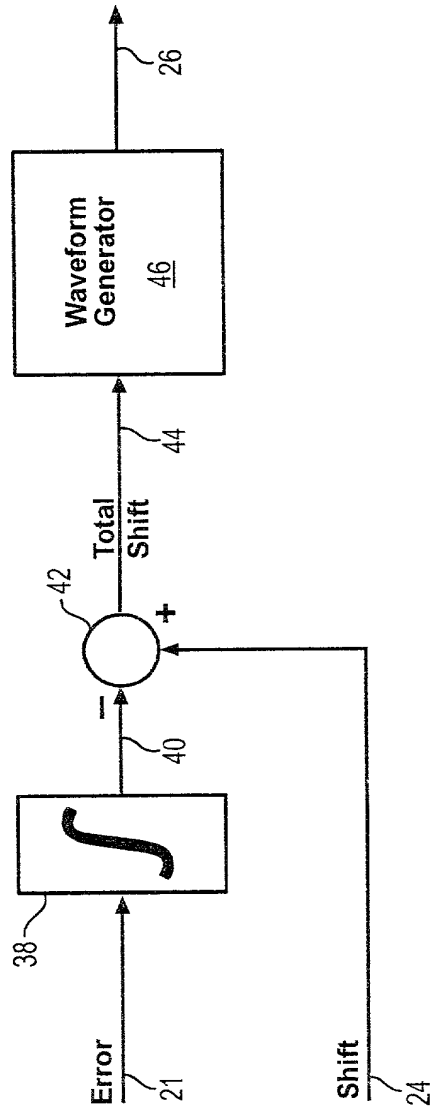


FIG. 4

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# Quadrature Modulation Synthesizer (With On/Off Data Keying)

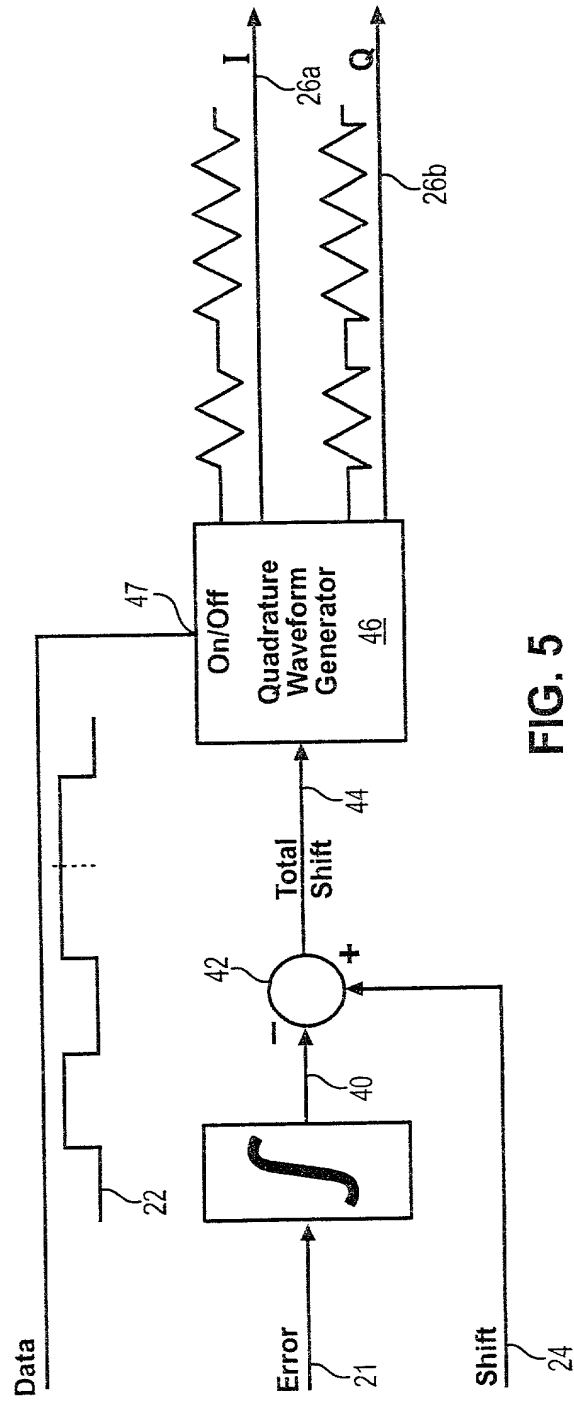


FIG. 5

FIG. 6 is a schematic diagram of a phase modulation device.

### Phase Modulation Device

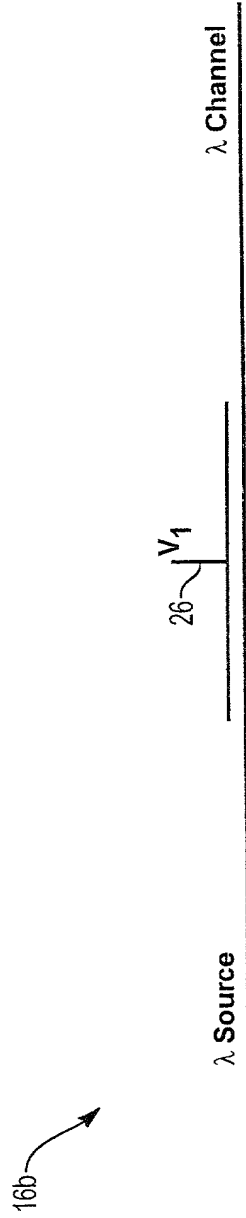


FIG. 6

# Modulation Synthesizer (With Frequency Shift Keying)

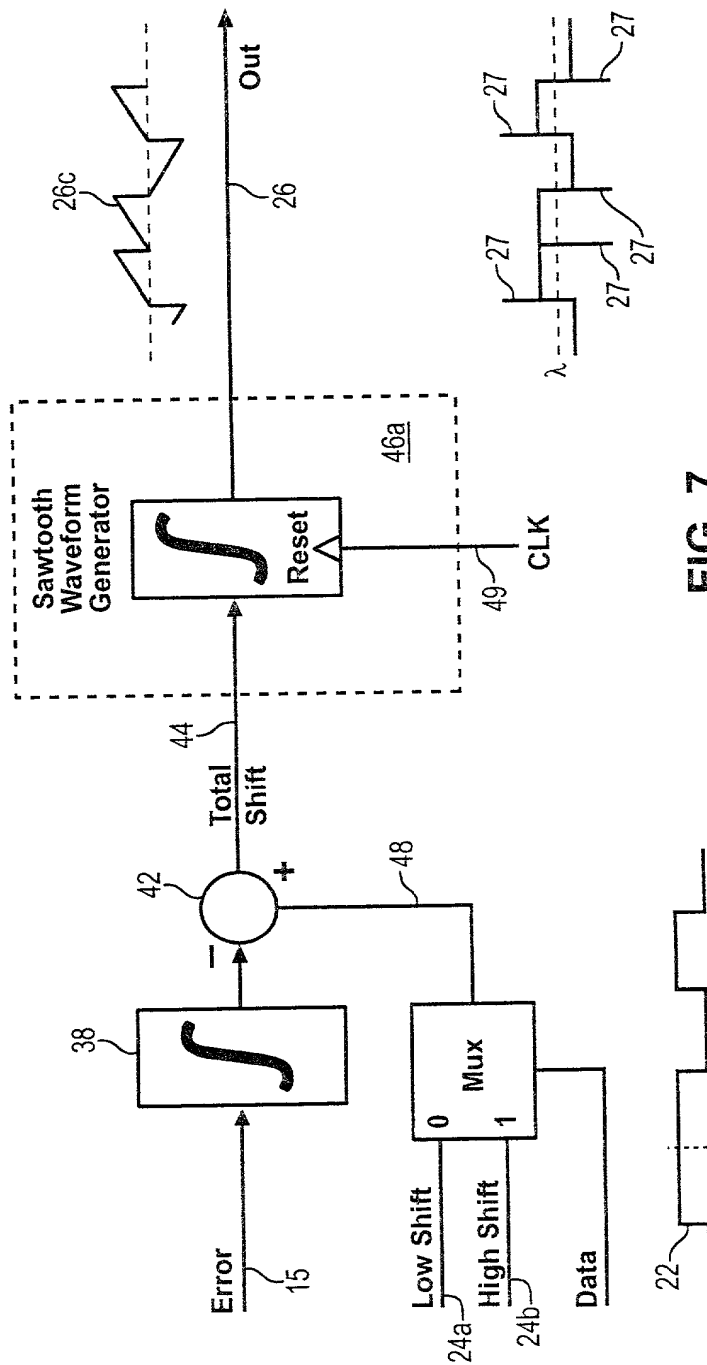
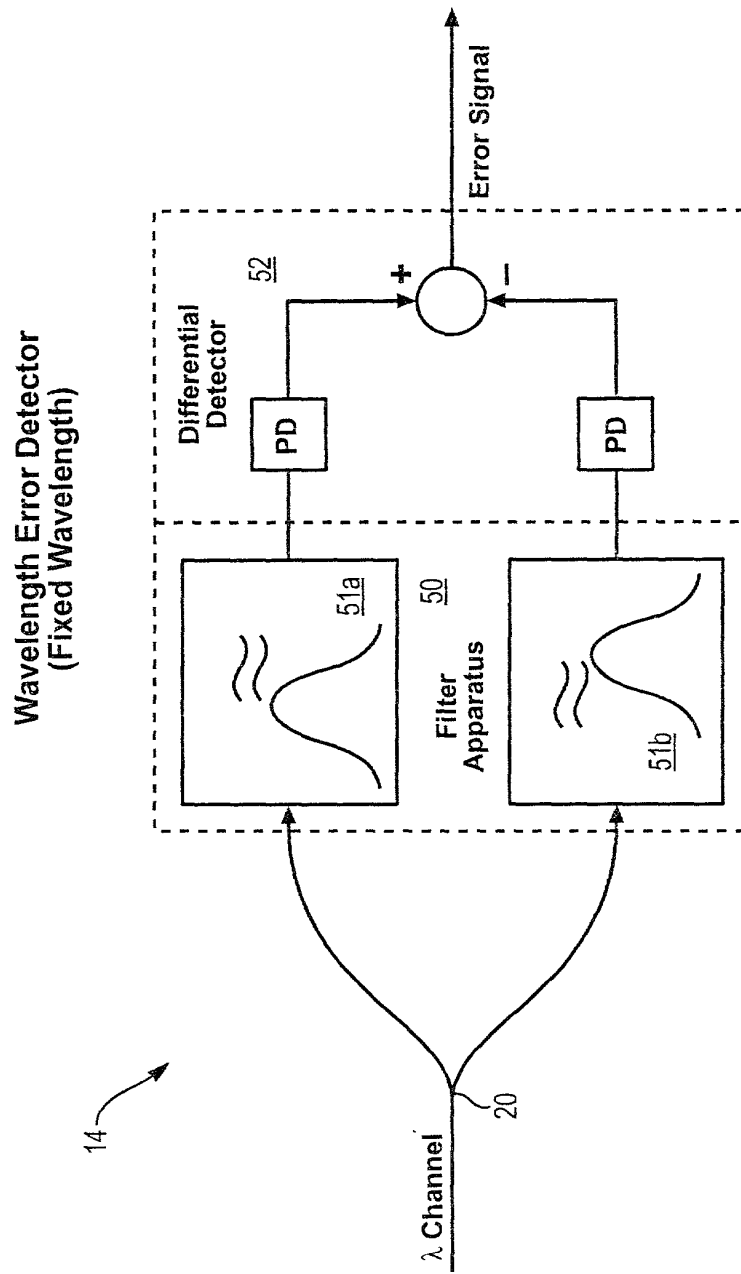


FIG. 7



**FIG. 8**



FIG. 9 is a block diagram of a Wavelength Error Detector (Tunable) 14. The detector 14 includes an input 20 for an input wavelength  $\lambda$  In. The input 20 is connected to a Modulation Device 16a and a Modulation Synthesizer 12. The Modulation Synthesizer 12 is connected to the Modulation Device 16a and a Modulation Device 16b. The Modulation Device 16a is connected to a Filter Apparatus 50 and a Differential Detector 52. The Modulation Device 16b is connected to the Filter Apparatus 50 and the Differential Detector 52. The Filter Apparatus 50 is connected to the Differential Detector 52. The Differential Detector 52 is connected to an Error output 15. The Error output 15 is a function of the input wavelength  $\lambda$  In and the reference wavelength  $\lambda$  REF. The Error output 15 is a function of the input wavelength  $\lambda$  In and the reference wavelength  $\lambda$  REF. The Error output 15 is a function of the input wavelength  $\lambda$  In and the reference wavelength  $\lambda$  REF.

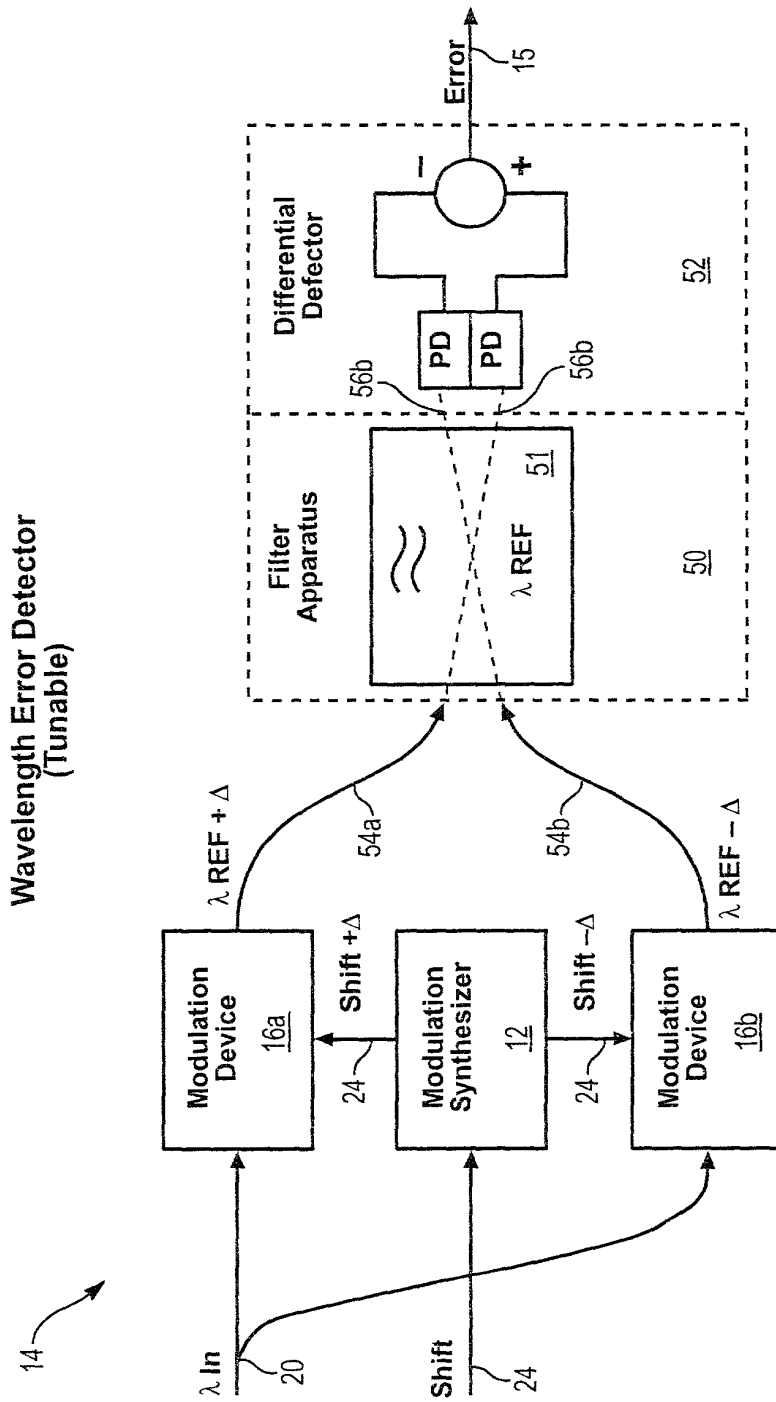


FIG. 9

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# Wavelength Error Detector (Tunable)

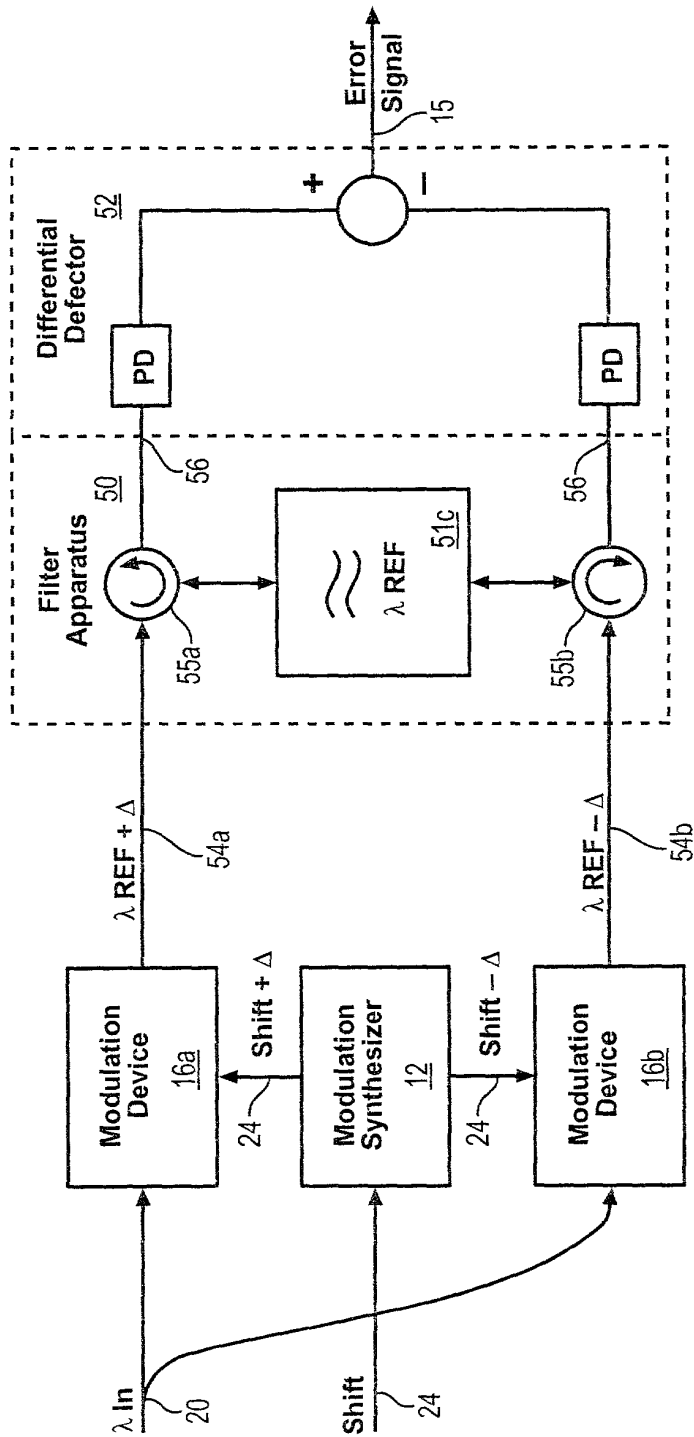


FIG. 10



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# Tunable Wavelength Stabilized Transmitter

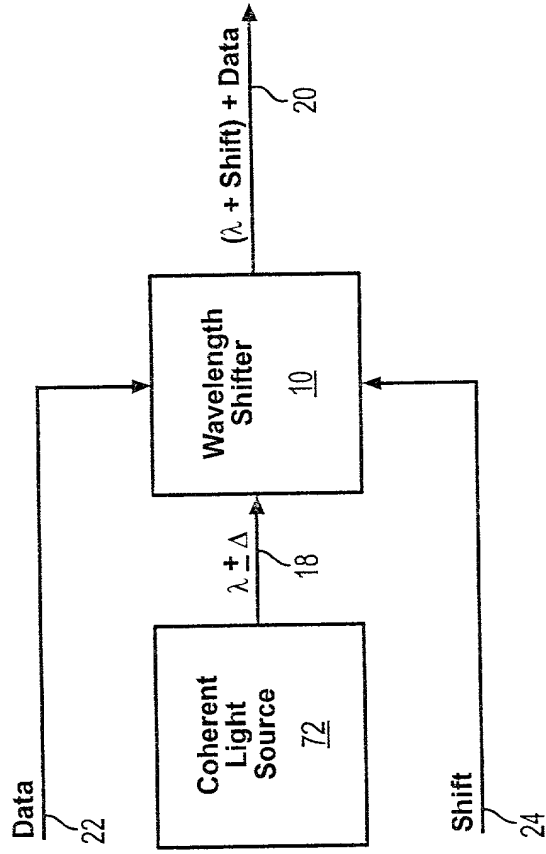


FIG. 12

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# Recursive Wavelength Shifter

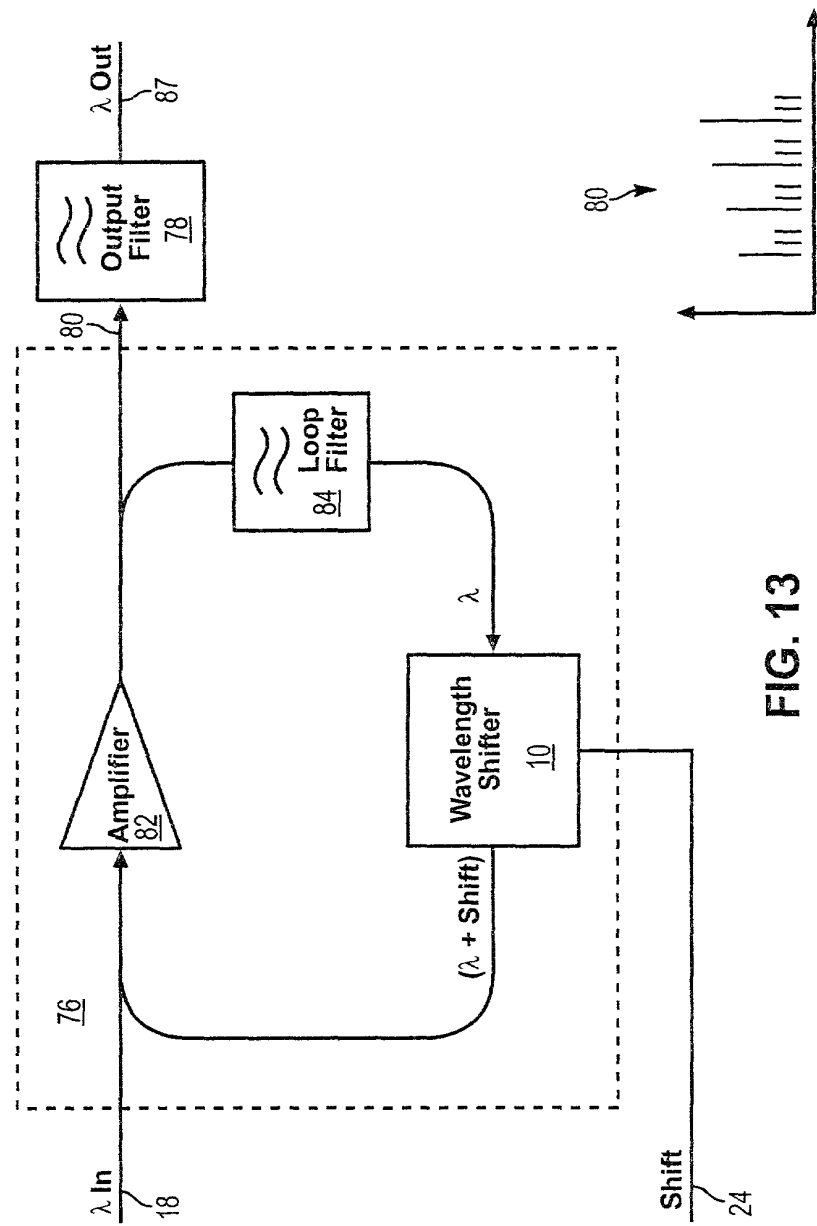


FIG. 13

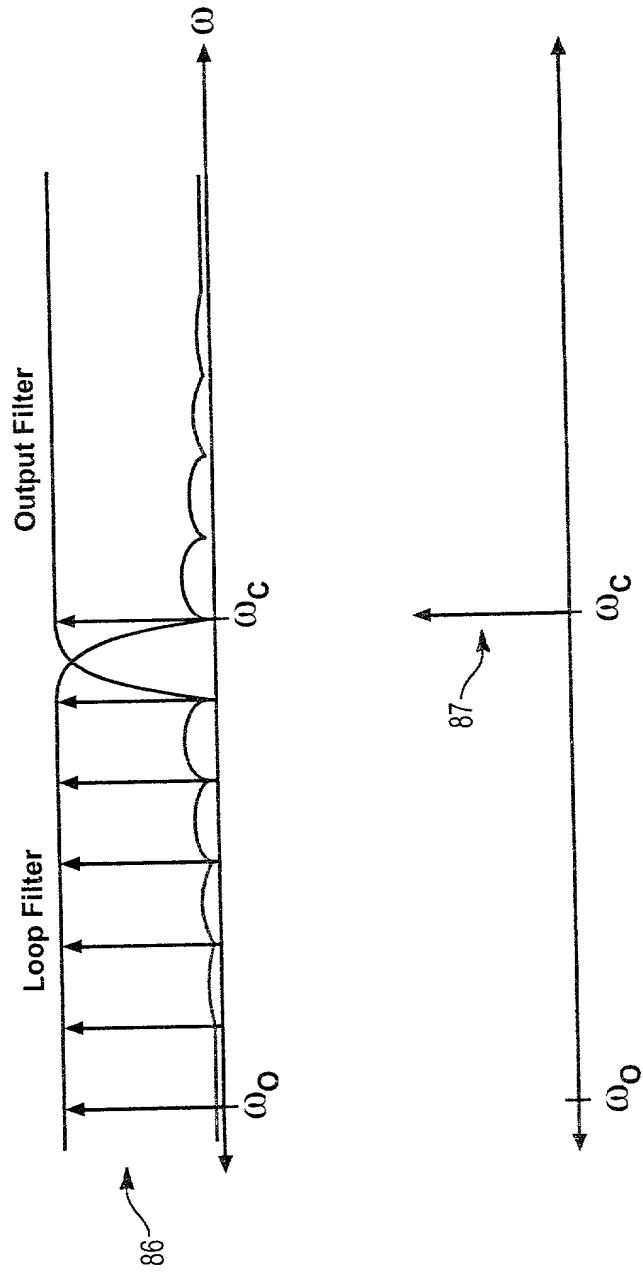


FIG. 14